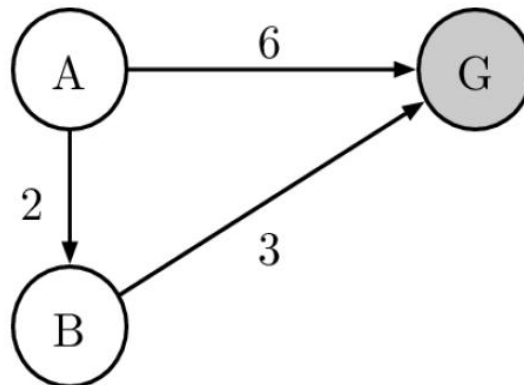


Problem 1: SEARCH: HEURISTIC FUNCTION PROPERTIES

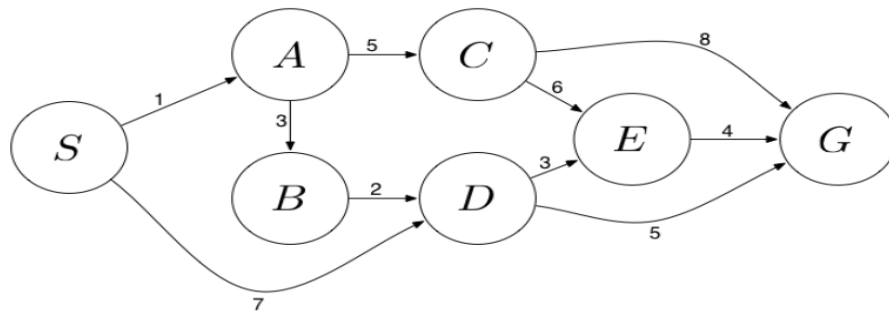
For the following questions, consider the search problem shown in the figure below. It has only three states, and three directed edges. A is the start node and G is the goal node. In the table below, four different heuristic functions are defined, numbered I through IV.



	$h(A)$	$h(B)$	$h(G)$
I	4	1	0
II	5	4	0
III	4	3	0
IV	5	2	0

- For each heuristic function below, check if it is an *admissible* heuristic.
- For each heuristic function below, check if it is a *consistent* heuristic.
- Which one of the following statements about the relationship between heuristic functions III and IV is true?
 - Heuristic function III dominates IV.
 - Heuristic function IV dominates III.
 - Heuristic functions III and IV have no dominance relationship.
- Which one of the following statements about the relationship between heuristic functions I and IV is true?
 - Heuristic function I dominates IV.
 - Heuristic function IV dominates I.
 - Heuristic functions I and IV have no dominance relationship.

Problem 2: Answer the following questions about the search problem shown above.



What path would breadth-first graph search return for this search problem?

- ☐ $S \rightarrow A \rightarrow B \rightarrow D \rightarrow G$
- ☐ $S \rightarrow A \rightarrow B \rightarrow D \rightarrow E \rightarrow G$
- ☐ $S \rightarrow A \rightarrow C \rightarrow G$
- ☐ $S \rightarrow A \rightarrow C \rightarrow E \rightarrow G$
- ☐ $S \rightarrow D \rightarrow G$
- ☐ $S \rightarrow D \rightarrow E \rightarrow G$

What path would uniform cost graph search return for this search problem?

- ☐ $S \rightarrow A \rightarrow B \rightarrow D \rightarrow G$
- ☐ $S \rightarrow A \rightarrow B \rightarrow D \rightarrow E \rightarrow G$
- ☐ $S \rightarrow A \rightarrow C \rightarrow G$
- ☐ $S \rightarrow A \rightarrow C \rightarrow E \rightarrow G$
- ☐ $S \rightarrow D \rightarrow G$
- ☐ $S \rightarrow D \rightarrow E \rightarrow G$

What path would depth-first graph search return for this search problem?

- ☐ $S \rightarrow A \rightarrow B \rightarrow D \rightarrow G$
- ☐ $S \rightarrow A \rightarrow B \rightarrow D \rightarrow E \rightarrow G$
- ☐ $S \rightarrow A \rightarrow C \rightarrow G$
- ☐ $S \rightarrow A \rightarrow C \rightarrow E \rightarrow G$
- ☐ $S \rightarrow D \rightarrow G$
- ☐ $S \rightarrow D \rightarrow E \rightarrow G$

What path would A* graph search, using a consistent heuristic, return for this search problem?

- ☐ $S \rightarrow A \rightarrow B \rightarrow D \rightarrow G$
- ☐ $S \rightarrow A \rightarrow B \rightarrow D \rightarrow E \rightarrow G$
- ☐ $S \rightarrow A \rightarrow C \rightarrow G$
- ☐ $S \rightarrow A \rightarrow C \rightarrow E \rightarrow G$
- ☐ $S \rightarrow D \rightarrow G$
- ☐ $S \rightarrow D \rightarrow E \rightarrow G$

Best wishes

Dr. Sherin El Gokhy